Roadway Condition Report
Route 17 in Delaware County

March 1983

MEMORANDUM
DEPARTMENT OF TRANSPORTATION

DATE March 10, 1983

SUBJECT ROADWAY CONDITION REPORT
ROUTE 17 IN DELAWARE COUNTY

FROM L. H. Moore, Technical Services Division, Rm. 210, Bldg. 7A L.H.M.

TO James K. Connors, Regional Director of Transportation, Region 9

All of Route 17 in Delaware County has been evaluated by personnel from the Region and Main Office Technical Services Division. Emphasis was placed on the present condition of the Portland cement concrete pavement; particularly joint faulting, pavement blowup, transverse pavement cracking and joint seals.

The recommended problem solutions in this report are considered to be the most practical ones available at the present state of technology.

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I. INTRODUCTION

A joint Regional-Main Office Technical Services group has made an evaluation of all of Route 17 in Delaware County. The investigation included a review of the as-built contract plans, field inspections and shoulder coring.

Route 17 in Delaware County is approximately 35 miles long. This four lane divided pavement is 9 inch thick reinforced Portland cement concrete with transverse joints at nominal 60 or 100 foot spacing. Many joints have a two component load transfer device. This portion of Route 17 was constructed under 6 contracts that were let between 1952 and 1965. Many of these pavement sections have reached or exceeded their design life. Some have been overlaid with asphalt concrete or are being planned for some rehabilitation work in the near future.

This report identifies existing major problems and recommends potential solutions for them. The report is sufficiently detailed to allow development of a strategy for the maintenance of pavement rideability and the prevention of further deterioration. Additional investigations will be necessary for any subsequent design work for rehabilitation contracts.

Participants

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Richard Calabrisi
James Dempsey
Charles Donahue
William Orshal
George Savage
Albert Ucker

II. BACKGROUND INFORMATION

New York State has many miles of 9 inch thick Portland cement concrete pavement which has reached or exceeded its design life. Much of this pavement has a two component type load transfer device. This load transfer device deteriorates with time resulting in variable degrees of pavement faulting.

This problem was thoroughly investigated and reported in the publications entitled "Portland Cement Concrete Pavement Performance - Interstate 84, Pennsylvania State Line to Connecticut State Line" dated March 1978 and "Roadway Condition Report - Route 17 in Sullivan County" dated September 1979.

III. OBSERVATION OF GENERAL ROADWAY CONDITIONS

Prior to making a field inspection of the roadway, the original construction contract limits, pavement and shoulder details and geometric data were obtained from the record plans. The Pavement Rideability Index (PRI) values from the 1981 Survey were also obtained.

Between June and October 1982, several inspections of Route 17 were conducted. Materials Bureau personnel were primarily concerned with the pavement conditions and Soils Bureau personnel were primarily concerned with the shoulder, earth and rock slopes, and surface drainage conditions. Shoulder cores were taken at random locations to determine the materials presently in place. Engineering Geologists from the Soil Mechanics Bureau inspected all the rock cut slopes.

The information gathered from the above activities is presented separately for each original construction contract. The preliminary rock cut slope recommendations and the shoulder core records are located in the Appendix.

Remedial earth slope treatment and edge drain applications have not been addressed in this report. These considerations should be dealt with during the design stages of any particular project.

IV. PAVEMENT DEFICIENCIES

The PCC pavements evaluated fall into two categories:

Category 1 -

Older pavement built a lane at a time with 100 foot long slabs and hand formed transverse expansion joints sealed with a hot poured bituminous sealer. Short sections of this type pavement have been resurfaced with thin overlays in isolated areas.

Category 2 -

Pavement built one or two lanes at a time with 60 foot - 10 inch long slabs and formed or sawed transverse contraction joints sealed with either 13/16 inch or 11/16 of an inch wide preformed neoprene sealers. In some areas, maintenance forces have resealed over the neoprene with hot poured asphalt.

The deficiencies common to pavements in these categories are:

Category 1 -

- Major spalling at transverse joints
- Wide working transverse slab cracks
- Longitudinal joint separation
- Failed joint sealers
- Existence of maintenance patches of various ages and conditions.
- Loss of original texture in the wheel tracks of the driving lane.
- Wheel track ruts due to wear

Category 2 -

- Objectionable faulting at transverse joints (3/16 of an inch or greater).
- Minor to major joint spalling at longitudinal and transverse joints.
- Wide working transverse slab cracks over cross culverts and where subbases have been weakened from excessive moisture.
- Some longitudinal joint separation.
- Failed joint sealers.
- Existence of maintenance patches of various ages and conditions.
- Loss of original texture in the wheel tracks of the driving lane.
- Wheel track ruts due to wear.

V. RECOMMENDED SOLUTIONS FOR CORRECTING DEFICIENCIES

Category 1 -

The only effective way to rehabilitate a pavement with deficiencies of this magnitude is to overlay it with dense asphalt concrete. Before this is done, however, the following should be accomplished:

- Replace structurally unsound PCC slabs with a full depth bituminous repair consisting of dense base or binder after correcting the cause of the condition.
- Provide full depth, full width pressure relief joints consisting of dense base or binder at existing blowup locations and structures and at intervals of 1000 to 1500 feet.
- Remove all loose spalls and maintenance patches, thoroughly clean the exposed voids, tack coat the voids and fill and compact dense bituminous concrete.
- Clean and seal all longitudinal and transverse joints and cracks in accordance with Section 633 of the Standard Specifications.

- Shim wheel track ruts that are 1/4" or greater.
- Clean and tack coat the existing PCC pavement.
- True & level as necessary.
- Overlay with dense graded asphalt concrete.
- Saw and seal transverse joints in the overlay if applicable (See EI 82-62).

Category 2 -

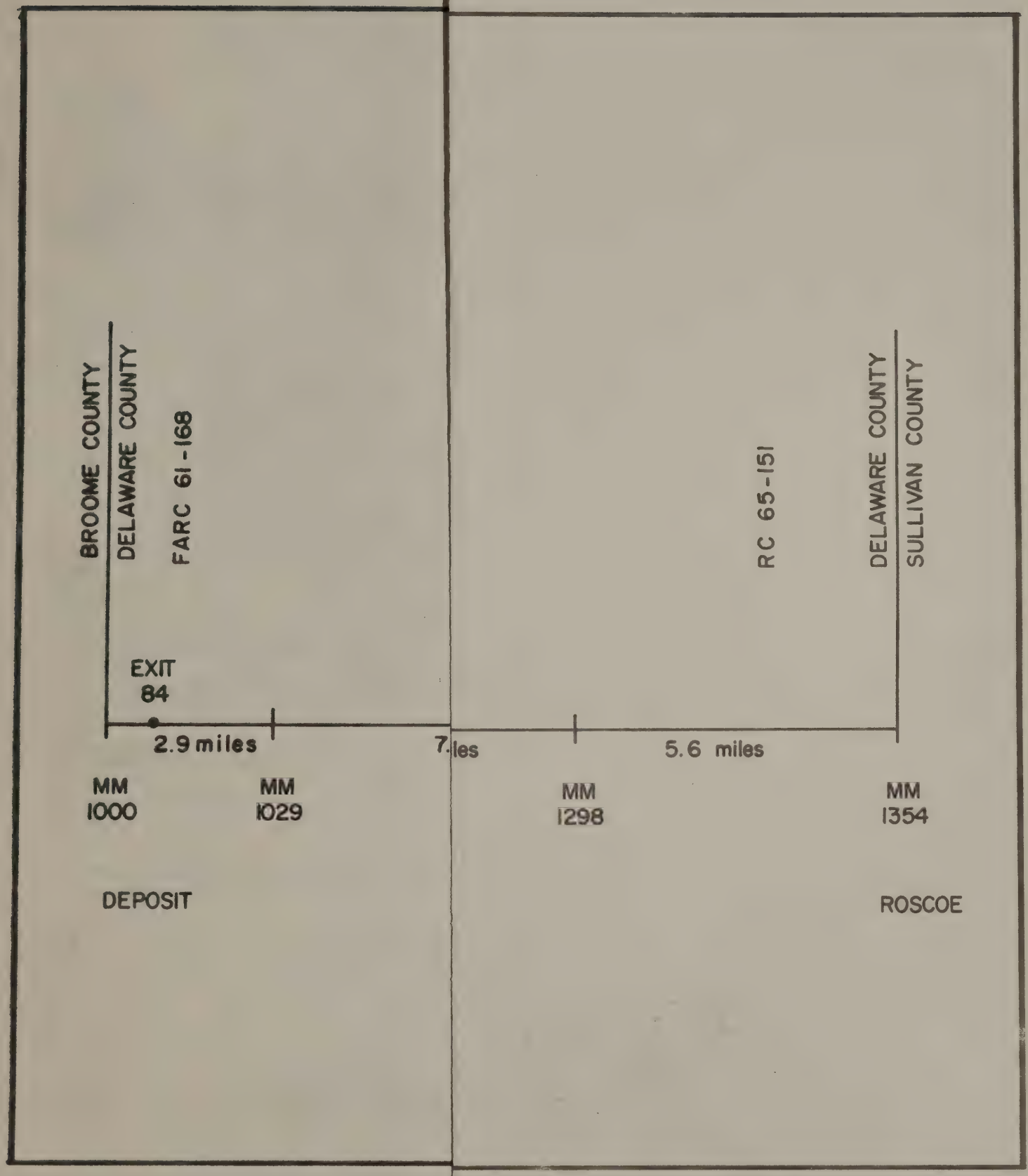
The PCC pavements in this category exhibit deficiencies of sufficient magnitude to warrant rehabilitation. Restoration can be achieved by either overlaying with bituminous concrete or by diamond grinding and patching. Based on experience to date, the cost benefit relationship of the two appear to be equal. From a first cost standpoint, overlaying is more expensive. However, it extends the serviceable life of the pavement longer since diamond ground pavements do refault. Neither solution attacks the root cause of joint faulting which is loss of load transfer.

If an overlay is chosen, the preliminary repairs to the PCC pavement prior to overlaying, as outlined in Category I, also apply here.

If grinding and patching is chosen, the recommended procedure is:

- Replace structurally unsound PCC slabs with a full depth bituminous repair consisting of dense base or binder after correcting the cause of the condition.
- Provide full depth full width pressure relief joints consisting of dense base or binder at existing blowup locations and structures and at intervals of 1000 to 1500 feet.
- Diamond grind the required depth to remove the faults.
- Remove all spalls and maintenance patches down to sound concrete. In doing this, any reinforcement exposed should also be removed.
- Thoroughly clean the exposed surfaces of the voids by sandblasting.
- Fill the voids with either $CaCl_2$ accelerated set concrete, set 45 or polymer concrete.
- When patches occur at a joint, saw new transverse or longitudinal joint grooves as soon as possible to eliminate "bridging" of the repair material and to provide a reservoir for a joint sealer.
- Sandblast the new joint grooves before resealing.
- Sandblast, clean and reseal all the other remaining longitudinal and transverse joints and cracks.

VI. PAVEMENT AND SHOULDER EVALUATION


BROOME COUNTY
DELAWARE COUNTY
FARC 61-168
EXIT
84
2.9 miles
7.1 miles
RC 65-151
5.6 miles
DELAWARE COUNTY
SULLIVAN COUNTY
MM
1000
MM
1029
MM
1298
MM
1354
DEPOSIT
ROSCOE

AREAS INVESTIGATED

BROOME COUNTY

DELAWARE COUNTY

FARC 61-168

FARC 52-39

FARC 64-112

RC 60-187

RC 65-171

RC 65-151

DELAWARE COUNTY

SULLIVAN COUNTY

EXIT 84 — 2.9 miles — 87 — 7.1 miles — 87 A — 7.2 miles — 89 — 6.8 miles — 90 — 5.8 miles — 5.6 miles

MM 1000 — MM 1029 — MM 1100 — MM 1172 — MM 1240 — MM 1298 — MM 1354

DEPOSIT — HANCOCK — EAST BRANCH — ROSCOE

FARC 61-168, HALES EDDY-DEPOSIT
ROUTE MILE MARKER 17-9107-3226 TO 17-9308-1032

PAVEMENT

Features

The PCC pavement was constructed two lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were sawed contraction joints sealed with preformed neoprene. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment.

Field Observations (MM 17-9107-3250 and 3236 Westbound)

Only minor spalling has occurred in the longitudinal and transverse joints. Transverse joint width varies from 1/4 to 1/2 of an inch while longitudinal joint width is more consistent at 1/4 to 3/8 of an inch. On the average there is one transverse crack per slab most of which are narrow and tight cracks. Faulting of the transverse joints is 1/4 to 3/8 of an inch. Average wheel track rut depth is 1/8 to 1/4 of an inch and the large aggregate is exposed in the driving lanes. Even though the preformed neoprene no longer functions, upward buckling type blow-ups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed of four (4) inches of Item 59 W-Stabilized Gravel Mixed Bituminous Treatment.

Field Observations

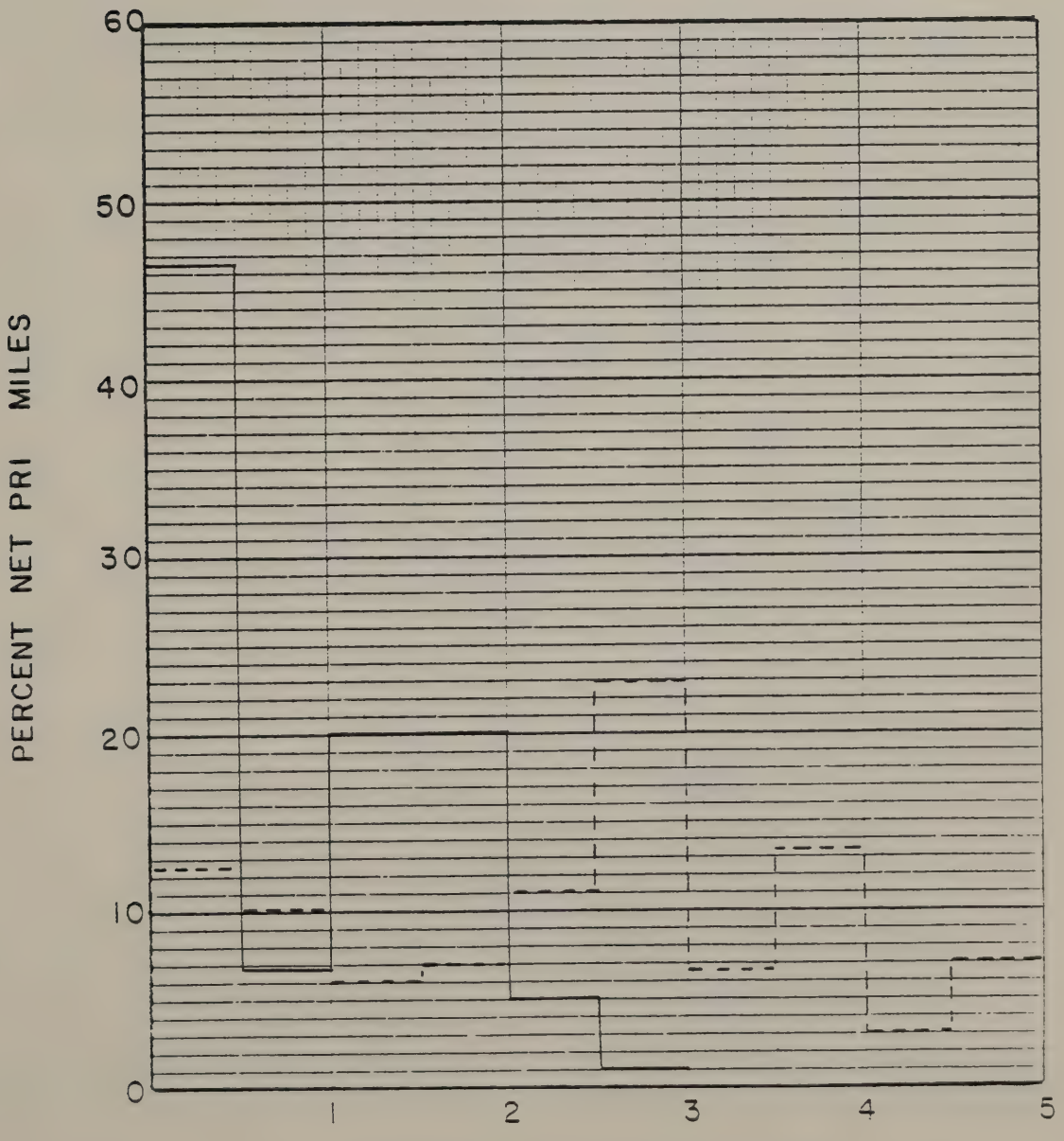
Both the eastbound and westbound outside shoulders are in good condition with a one (1) inch dropoff at the pavement shoulder interface.

Both the median shoulders are in fair condition as evidenced by intermittent raveling.

FARC 61-168

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	——EB	- - - WB	
SURVEY DATE	6/25/81	6/25/81	
% MISSING PRI	0.349	0.900	
W MEAN	0.749	2.448	
POST SPEED, MPH	55	55	
PAVT. TYPE/MI	RIGID	RIGID	

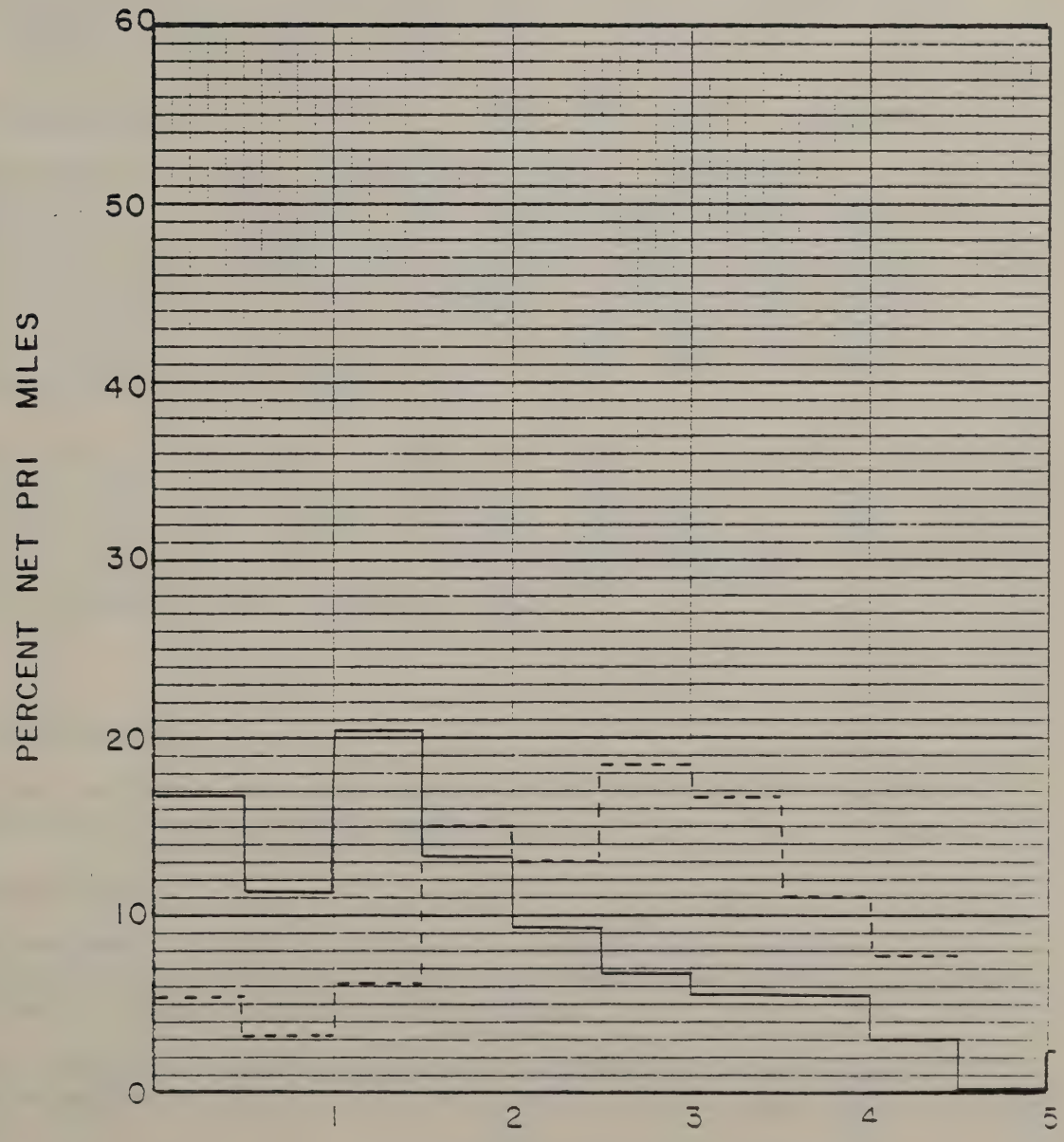
9308
1000 to 1030



FARC 61-168

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	6/25/81	6/24/81	
% MISSING PRI	0.000	0.793	
W MEAN	1.714	2.466	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

9107
3229 to 3262



FARC 52-39, HALES EDDY-HANCOCK
ROUTE MILE MARKER 17-9308-1029-1100

PAVEMENT

Features

The PCC pavement was constructed a lane at a time resulting in two lanes in each direction. Slab lengths are 100 feet and the longitudinal and transverse joints were formed expansion joints sealed with a liquid bituminous sealer. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment.

Since construction, the pavement surface between MM 17-9308-1069 to 1071 and MM 17-9308-1075 to 1078 eastbound, MM 17-9308-1075 to 1078 westbound and MM 17-9308-1051 to 1056 east and westbound has been grooved in the longitudinal direction. In addition, there are four locations on the contract that have been resurfaced. These bituminous patches range in length from 50 to 1100 feet.

Field Observations (MM 17-9308-1015, 1066, 1083 and 1097 westbound)

The transverse joints were considerably narrower than originally constructed, now being 1/4 to 1/2 of an inch wide. Many of these joints were badly spalled and have been patched by maintenance forces. There is also evidence of shattering at many of the joints,(a type of blowup condition which does not buckle the pavement upward). Transverse cracking averages greater than one per slab, the majority of which are wide, working, spalled and patched. Transverse joint faulting, on the other hand, is minimal, with the maximum measured at 1/4 of an inch.

The longitudinal joints vary in width from 3/8 to 1-1/2 inches, indicating the loss of some longitudinal tie bars. For the most part, only minor spalling has developed. However, there are areas where extensive spalling has occurred. Average wheel track rut depth ranges between 1/8 and 1/4 of an inch in both driving and passing lanes. Upward buckling type blowups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed of six (6) inches of Item 259S - Calcium Chloride Treated Gravel Shoulders.

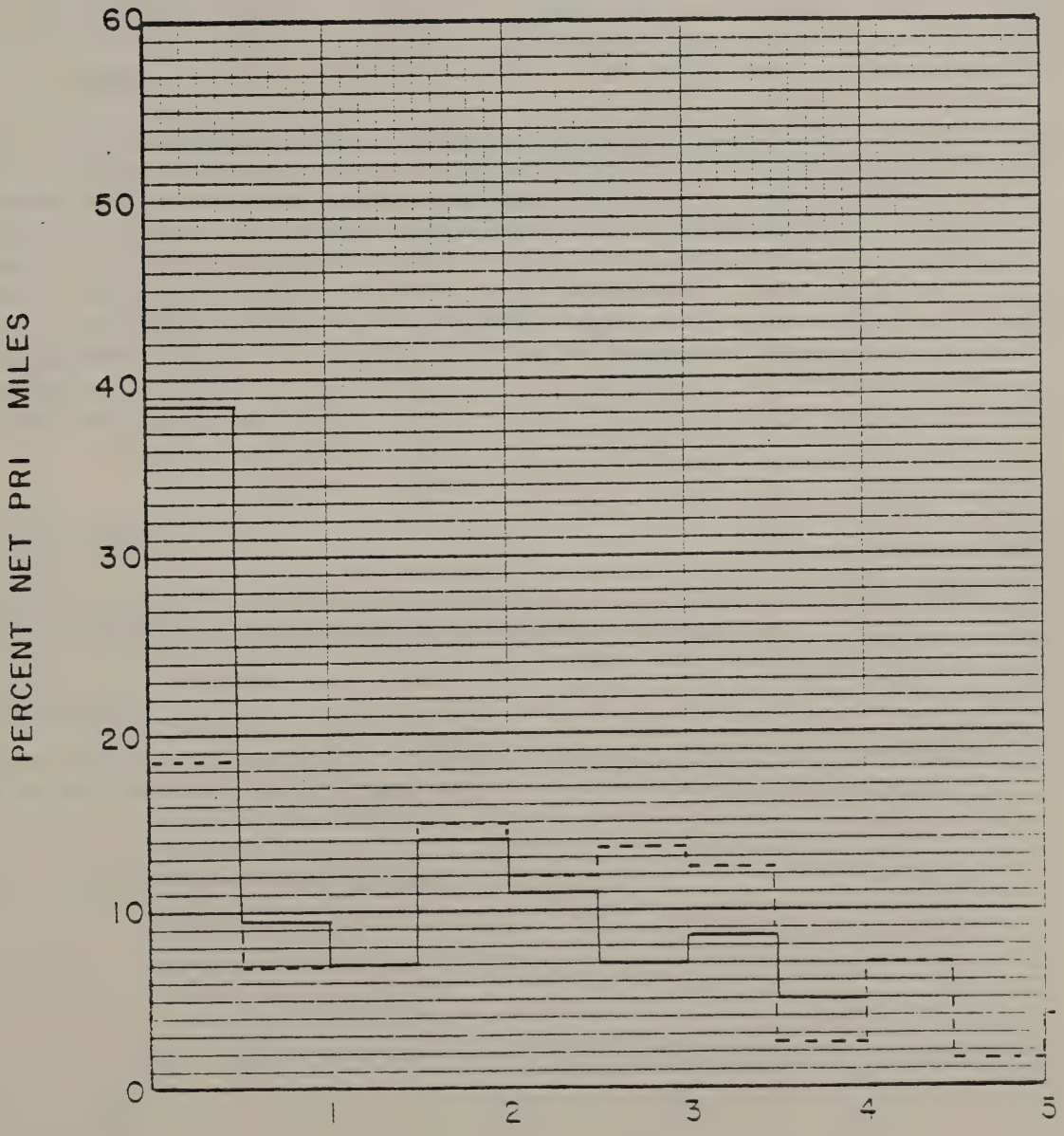
Field Observations

Both the eastbound and westbound shoulders are in poor condition exhibiting shims ranging in widths of two (2) to three (3) feet, a one (1) inch± dropoff, alligator cracking and pealing.

Both the eastbound and westbound median shoulders are in poor shape with the exception of intermittent areas where a new wearing surface has been applied.

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	6/25/81	6/25/81	
% MISSING PRI	0.000	0.000	
W MEAN	1.356	2.108	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

9308
1030 to 1103



FARC 64-112, HANCOCK-EAST BRANCH, PT. 1, HALES EDDY-HANCOCK
ROUTE MILE MARKER 17-9308-1100-1172

PAVEMENT

Features

The PCC pavement was constructed two lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were sawed contraction joints sealed with preformed neoprene. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment.

Since contraction, the pavement surface between MM 17-9308-1118 and 1119 eastbound, MM 17-9308-1127 and 1131 westbound, and between MM 17-9308-1135 and 1142 and MM 17-9308-1149 and 1155 east and westbound has been grooved in the longitudinal direction. In addition, a 500 foot long asphalt overlay has been placed in the vicinity of MM 17-9308-1100, westbound.

Field Observations (MM 17-9308-1125, 1148 & 1164 westbound)

Only minor spalling has occurred in the longitudinal and transverse joints. Longitudinal joint width is approximately the same as originally constructed. For the most part transverse joints are also the same width although some were found to be wider than when they were built. Transverse cracking of slabs was minimal, with only 12 found in the 30 slabs inspected in detail. All of these cracks were narrow and tight. Transverse joint faulting measured 1/4 to 3/8 of an inch, while wheel track rut depth in the driving lanes was approximately 1/8 of an inch. Large aggregate exposure in the wheel tracks was minimal. Upward buckling type blowups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed of four (4) inches of Item 59WW. Bituminous Stabilized Shoulder Course (including shoulders).

Field Observations

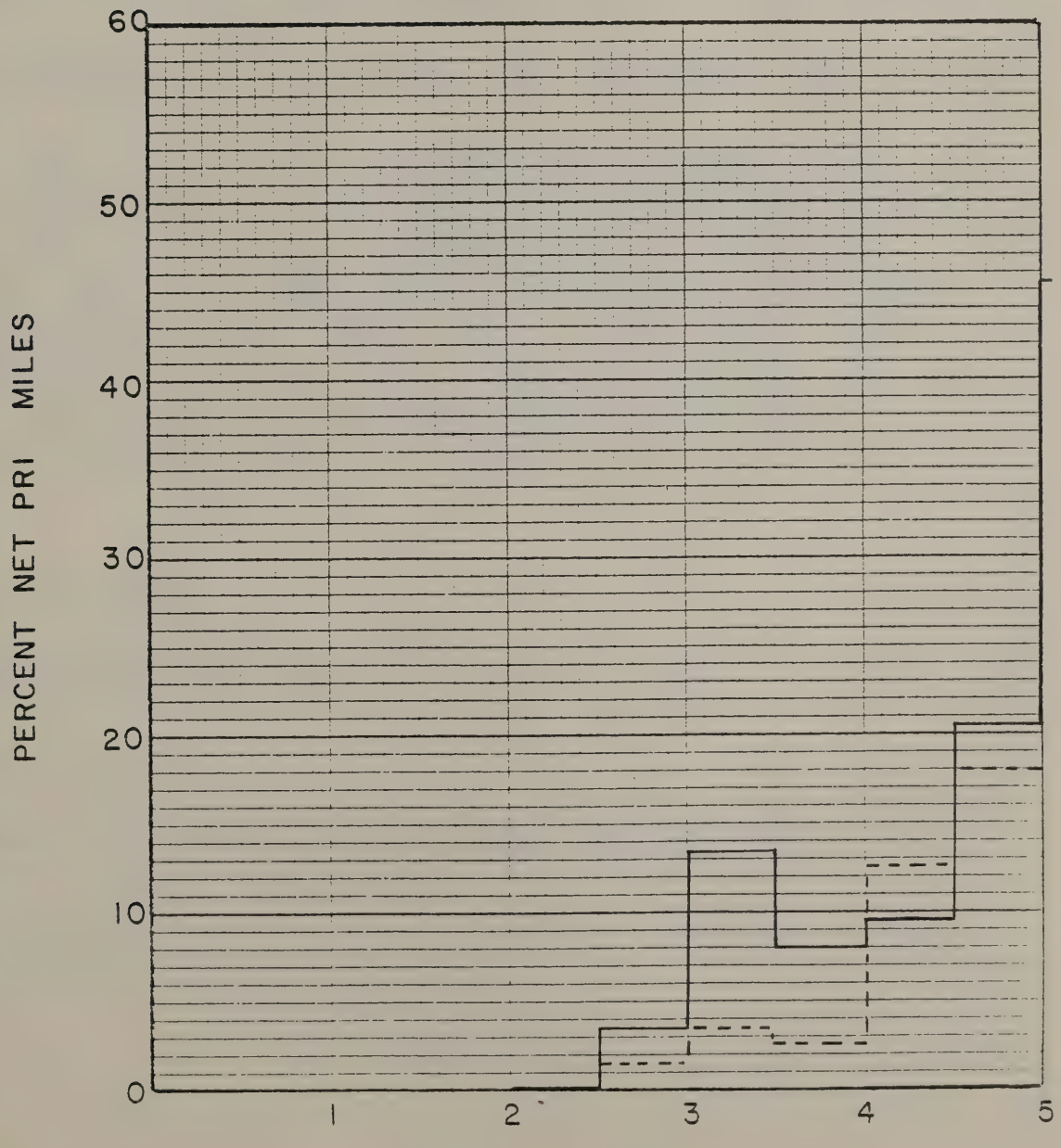
Both the eastbound and westbound outside shoulders are in good condition. There is some minor alligator cracking and a one-half (½) inch dropoff at the pavement-shoulder interface.

Both the median shoulders are in good condition.

FARC 64-112

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	9/18/81	9/18/81	
% MISSING PRI	1.570	0.067	
W MEAN	4.480	4.738	
POST SPEED, MPH	55	55	
PAVT. TYPE/MI	RIGID	RIGID	

9308
1103 to 1164



RC 60-187, EAST BRANCH-SULLIVAN CO. LINE, PT. 1
HANCOCK-EAST BRANCH, PT. 1 & 2
ROUTE MILE MARKER 17-9308-1172-1240

PAVEMENT

Features

This PCC pavement was constructed two lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were formed contraction joints sealed with liquid and preformed neoprene sealers respectively. Since then, maintenance forces have resealed the transverse joints, pouring hot asphalt over the original sealers. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment.

Presently, the pavement surface between MM 17-9308-1228 and 1234 westbound is grooved in the longitudinal direction.

Field Observations (MM 17-9308-1167, 1186, 1205, 1221 & 1235 westbound)

Overall, spalling of transverse joints is minor with an occasional large spall. This, however, is the only deficiency on the contract that is relatively consistent. In some areas the transverse joints are narrower and, in others, wider than originally constructed, the measurements ranging from 1/4 to 1 inch. Transverse cracking of slabs averaged less than one per slab. This is misleading however, since there was one area where slab cracking could not be found. In all the other areas, cracks were of the wide working variety. Transverse joint faulting ranges from zero to 1/2 of an inch. Longitudinal joint faulting of 1/2 of an inch was found in one area. Average wheel track rut depth in the driving lanes was 1/4 of an inch with less wear in the passing lanes. Upward buckling type blowups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed of five (5) inches of Item 59TCMX-Stabilized Gravel Mixed Bituminous Treatment-Shoulders.

Field Observations

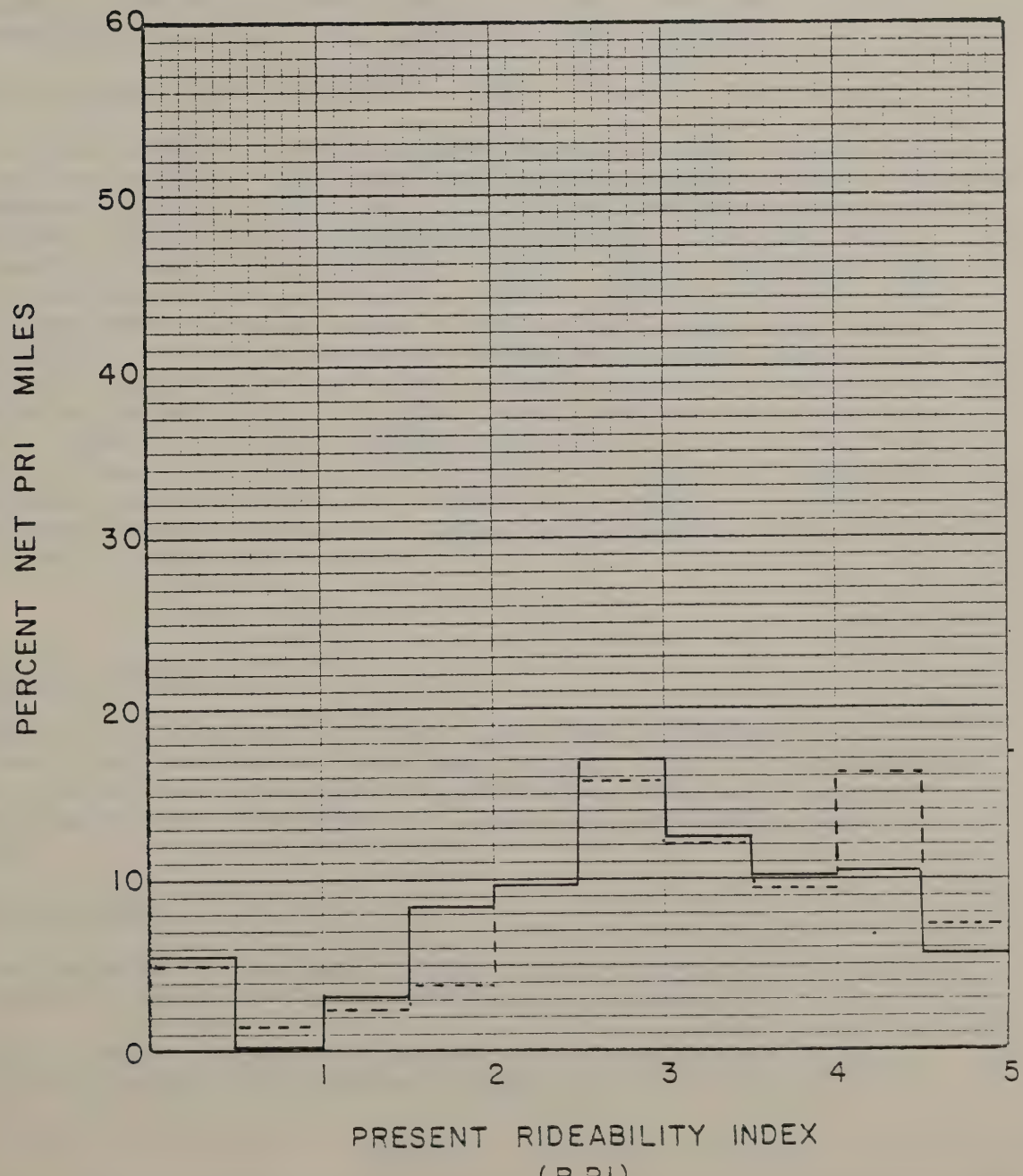
Both the eastbound and westbound outside and median shoulders are in fair condition with alligator cracking throughout and longitudinal cracks eighteen (18) inches from the pavement/shoulder interface.

Accumulations of sand along the outside edges of the shoulders impedes surface drainage.

RC 60-187

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	9/18/81	9/18/81	
% MISSING PRI	0.000	0.000	
W MEAN	3.169	3.354	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

9308
1165 to 1238



RC 65-171, EAST BRANCH-SULLIVAN CO. LINE, PT. 1
ROUTE MILE MARKER 17-9308-1240-1298

PAVEMENT

Features

The PCC pavement was constructed two lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were sawed contraction joints sealed with preformed neoprene. Surface texture was done with burlap, dragged longitudinally behind the paving equipment.

Since construction, the pavement surface between MM 17-9308-1269 and 1274 in the eastbound lanes has been grooved in the longitudinal direction. In addition, there are four locations on the contract that have been resurfaced. Bituminous patches, ranging in length from 200 to 500 feet, lie between MM 17-9308-1257 and 1262 in the westbound lanes.

Field Observations (MM 17-9308-1250, 1265, 1277 and 1291 Westbound)

Overall, this pavement is in good condition except in the area containing the bituminous patches. Only minor spalling has occurred at the longitudinal and transverse joints and both are virtually the same width as originally constructed. Transverse joint faulting averages 3/8 of an inch while wheel track rut depth is approximately 1/8 of an inch. The larger aggregates in the surface are not exposed. However, some minor pockmarking has occurred where coarse aggregate particles have deteriorated close to the surface. Transverse cracking averages one per slab, most being narrow and tight. This average is misleading, however, as the majority of cracks are concentrated in the same general area as the bituminous patches. Cracks of the wide working variety can also be found in this same general area. The presence of both working cracks and bituminous patches in the same area indicate they may be the result of a problem that occurred during construction. Upward buckling type blowups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed with four (4) inches of Item 59WWA Bituminous Stabilized Course (including shoulder) and two (2) applications of Item 260-Seal Coat. The first two (2) feet of the shoulder adjacent to the pavement was treated with one (1) inch of Item 51MXA Asphalt Concrete.

Field Observations

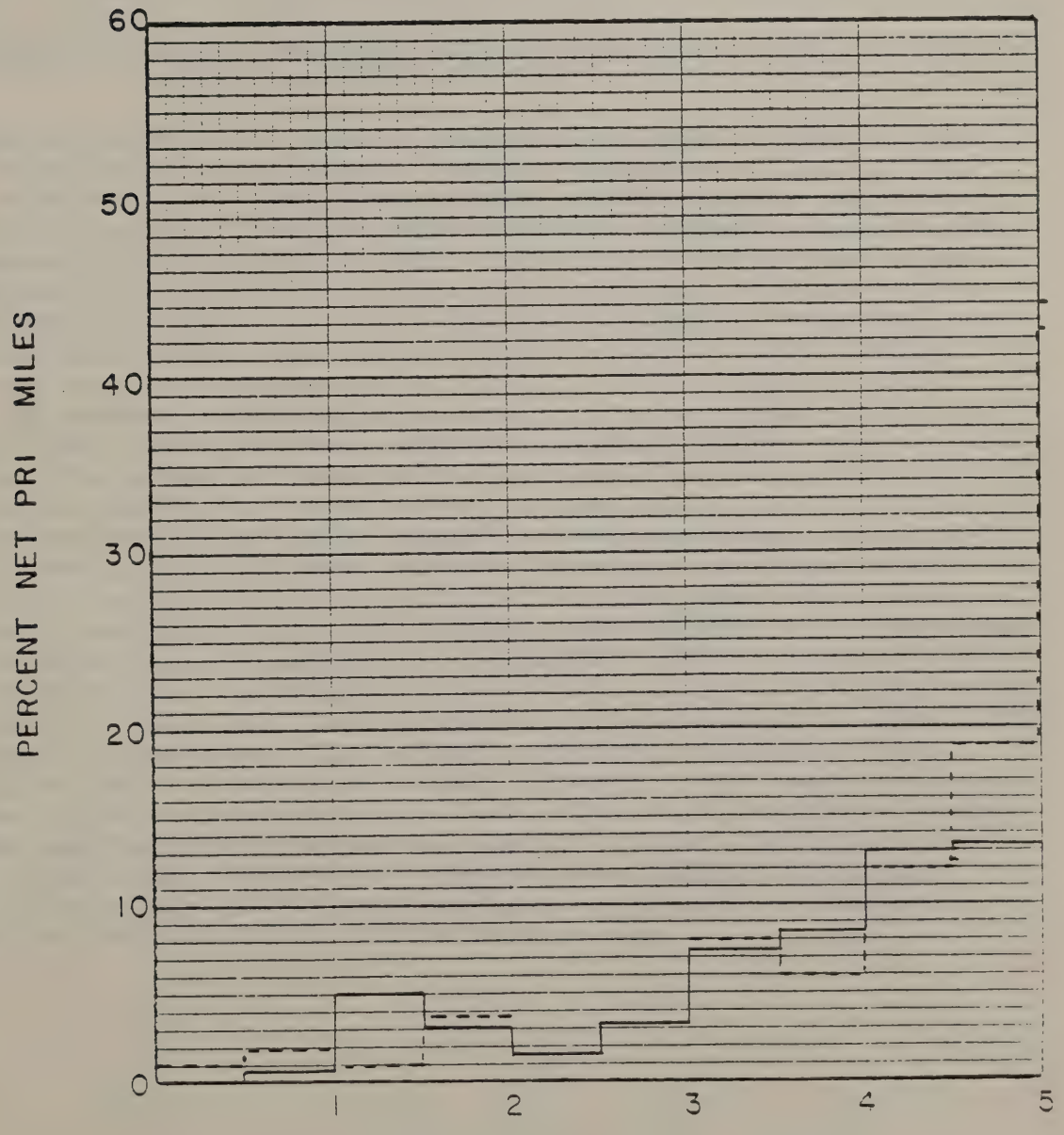
Both the eastbound and westbound outside shoulders are in poor condition as evidenced by the extensive alligator cracking present.

The median shoulder is generally in good condition with some dropoff and cracking at the shoulder/pavement interface.

RC 65-171

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - -WB	
SURVEY DATE	9/18/81	9/18/81	
% MISSING PRI	0.000	0.000	
W MEAN	4.085	4.088	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID 4.65 OVERLAY 0.217	

9308
1239 to 1296



RC 65-151, EAST BRANCH-SULLIVAN CO. LINE, PT. 2
LIBERTY CO. LINE, PT. 2
ROUTE MILE MARKER 17-9308-1298-17

PAVEMENT

Features

The PCC pavement was constructed two lanes wide in each direction. Slab lengths are 60 feet, 10 inches and the longitudinal and transverse joints were sawed contraction joints sealed with preformed neoprene. Surface texturing was done with burlap, dragged longitudinally behind the paving equipment.

Since construction, the pavement surface between MM 17-9308-1319 and 1335 east and westbound, and between MM 17-9308-1348 and 1353 eastbound has been grooved in the longitudinal direction.

Field Observations (MM 17-9308-1305 and 1334 eastbound and MM 17-9308-1320, 1341 and 1352 westbound)

Most all the deficiencies found in the westbound lanes of this contract appear to be construction related. On the eastern end of the westbound lanes, there are slabs where the wire mesh reinforcement was placed too close to the surface. Over the years, the wire mesh has corroded causing the pavement to spall. Also, practically every transverse joint in the same general area had been repaired by the contractor, with many of the repairs being 12 inches wide across the full lane width. Presently, the repair patches are badly spalled and in need of repair. Wide working transverse cracks, averaging one per slab, can also be found in this area. The pavement condition in the westbound lanes improve farther to the west, indicating that the construction related problems were corrected as paving progressed. However, on the western end of the westbound lanes, longitudinal cracking was encountered. It appears that this condition may also have been construction related, as the sawed joint was only 1-1/4 inches in depth. None of these construction related deficiencies were found in the eastbound lanes except for a few minor joint spalls that had been epoxy repaired. Despite the problems that developed in isolated areas during construction, the majority of the pavement on this contract is in good condition. For the most part, only minor spalling of the longitudinal and transverse joints has occurred and both types are about the same width as originally constructed. In the westbound lanes, transverse joint faulting was only 1/8 to 1/4 of an inch. However, joint faulting in the eastbound lanes was 3/8 to 3/4 of an inch. Transverse cracking of slabs averaged less than one per slab, the majority of cracks being narrow and tight. Wheel track rut depth was only 1/8 of an inch in the driving lanes and large aggregate exposure was minimal. Upward buckling type blowups have not occurred on this contract to date.

SHOULDER

Record Plan Details

The original shoulders were constructed of four (4) inches of Item 51 MX Asphalt Concrete.

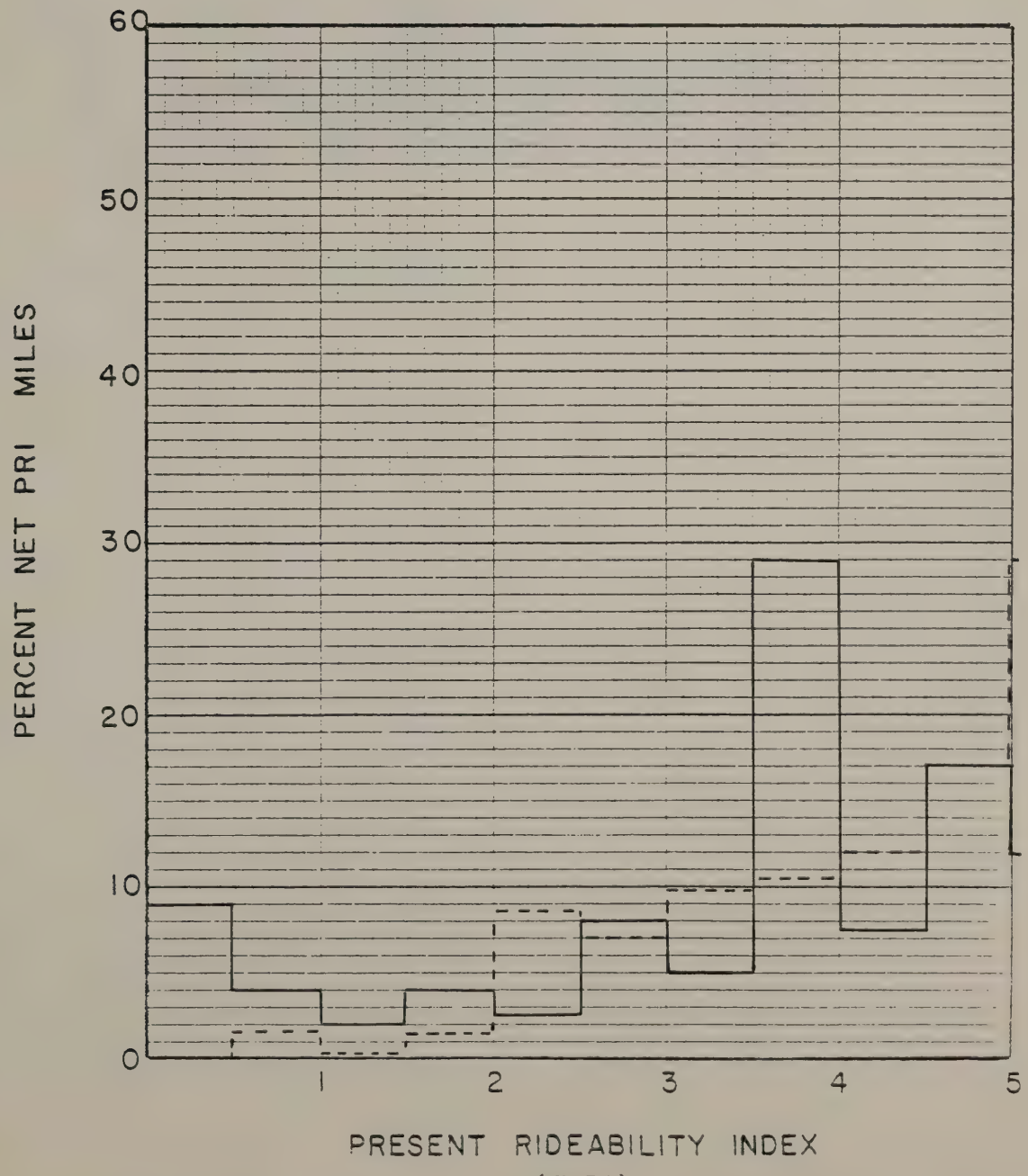
Field Observations

Generally both the eastbound and westbound median and outside shoulders are in good shape. There is some sporadic alligator cracking, a one-half (½) dropoff and one-half (½) inch separation at the shoulder/pavement interface.

RC 65-151

DATA SHOWN			
YEAR	1981	1981	
SYMBOL	—— EB	- - - WB	
SURVEY DATE	9/18/81	9/18/81	
% MISSING PRI	0.99	2.26	
W MEAN	3.344	3.914	
POST SPEED, MPH	55	55	
PAVT. TYPE / MI	RIGID	RIGID	

9308
1297 to 1354



APPENDIX A

The captioned photographs in this Appendix depict the general deficiencies that are described in the text and were taken in both Broome and Delaware Counties.

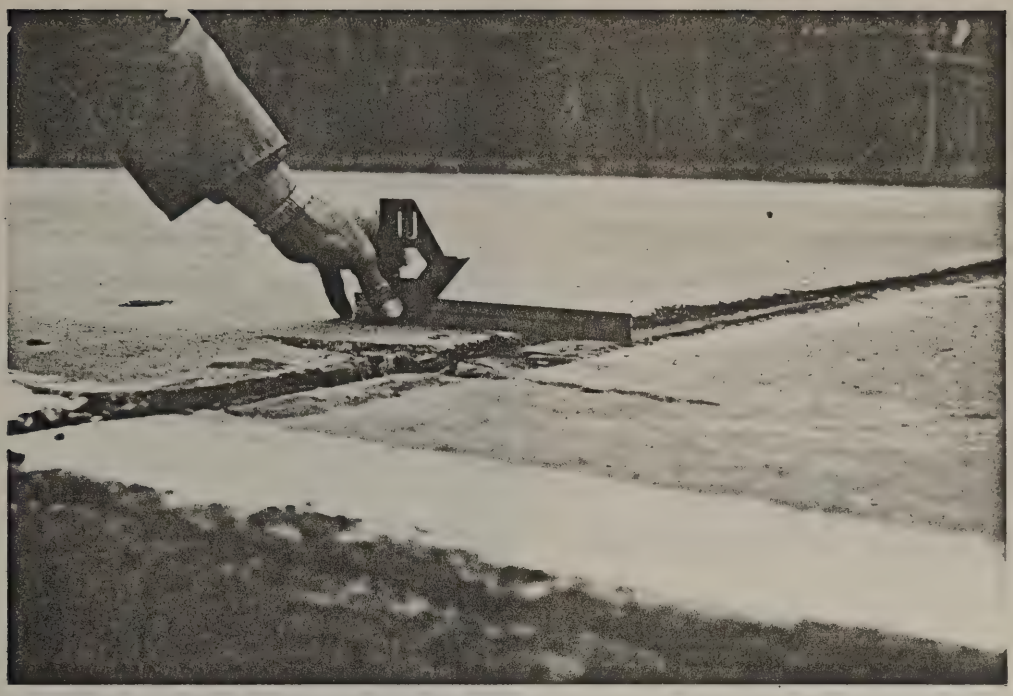


PHOTO 1
Transverse Joint Faulting

PHOTO 2

Major Transverse Joint Spalling, Patched by Maintenance Forces.

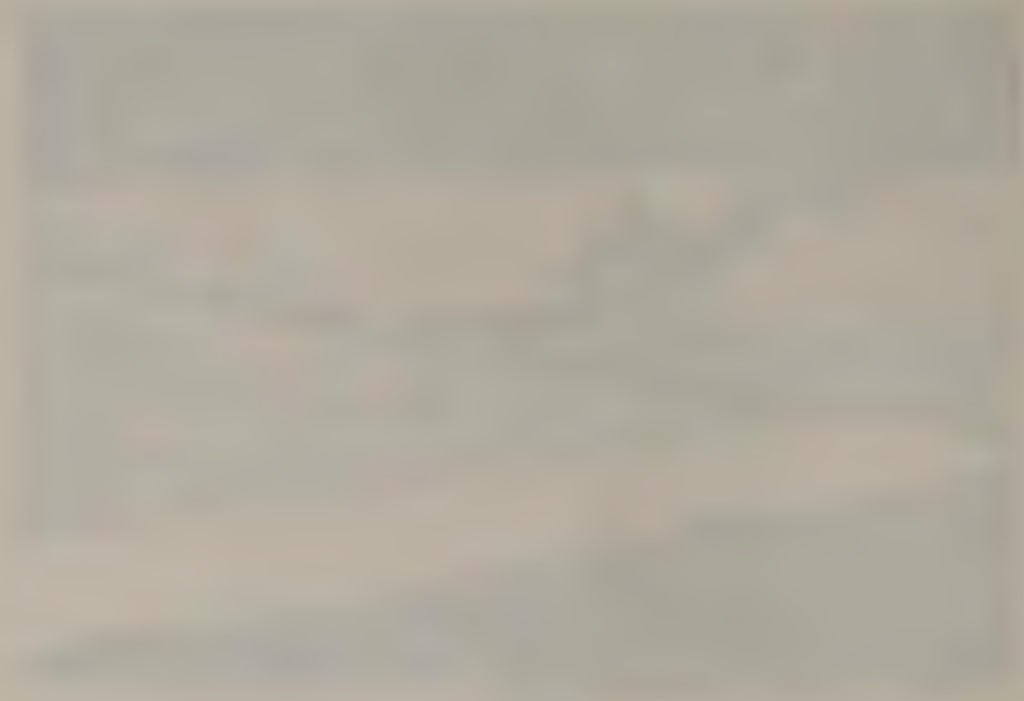


PHOTO 3

Minor Transverse Joint Spalling

PHOTO 4

Major Longitudinal Joint Spalling, Patched by Maintenance Forces

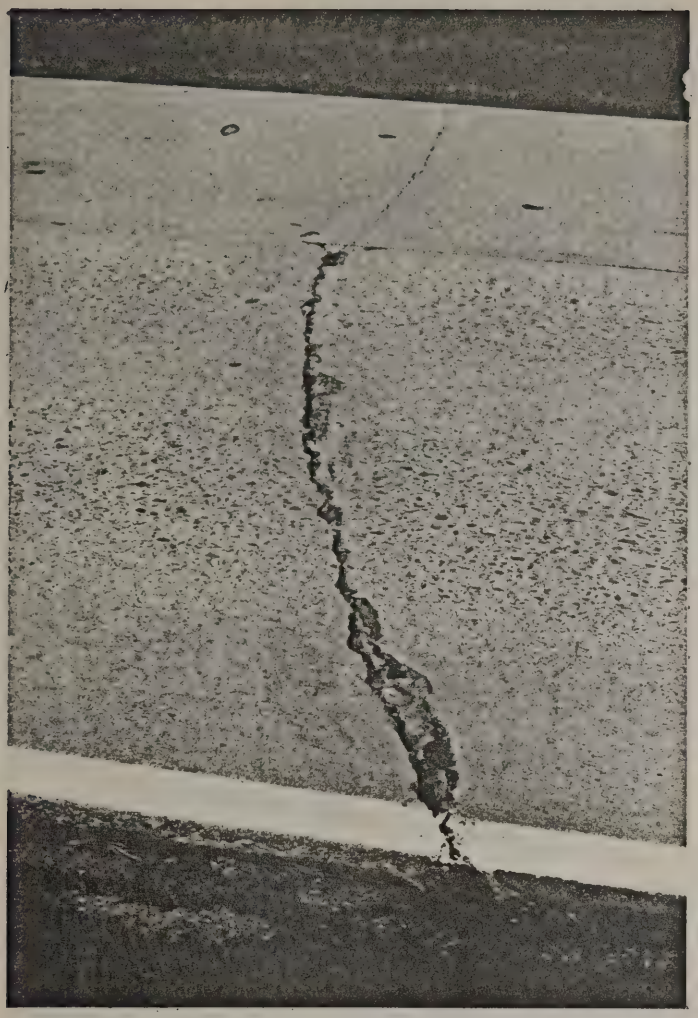


PHOTO 5

Wide, "Working" Mid Slab Crack Which Has Faulted and Spalled

PHOTO 6

A Failed Preformed Neoprene Extrusion Lost From a Transverse Contraction Joint

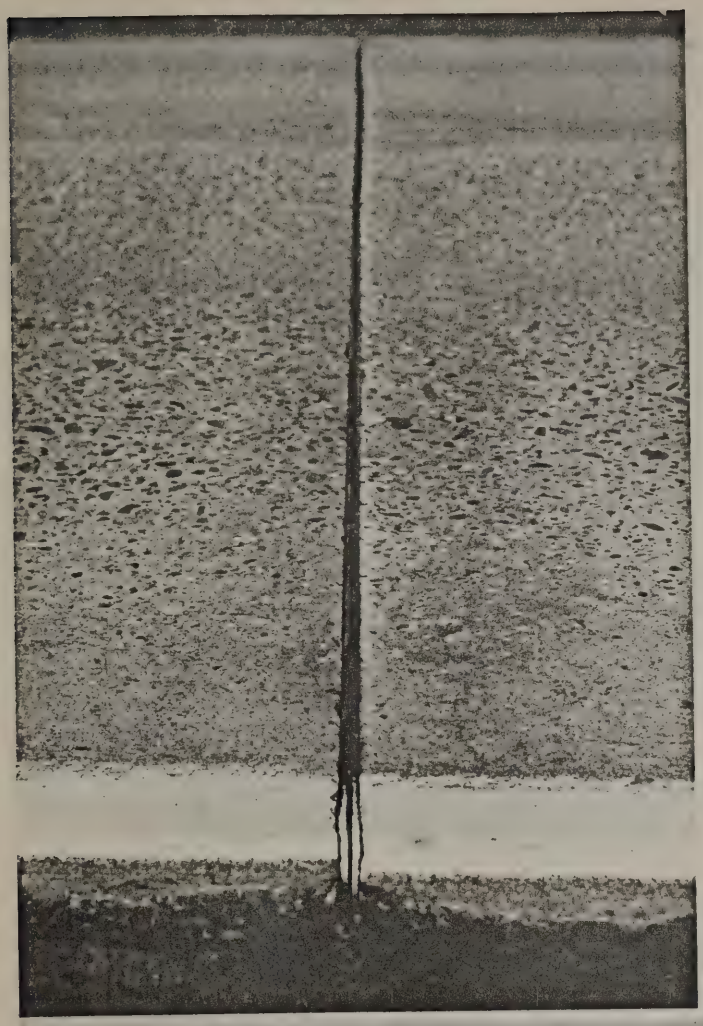


PHOTO 7

A Preformed Neoprene Extrusion
Still Sealing a Transverse
Contraction Joint

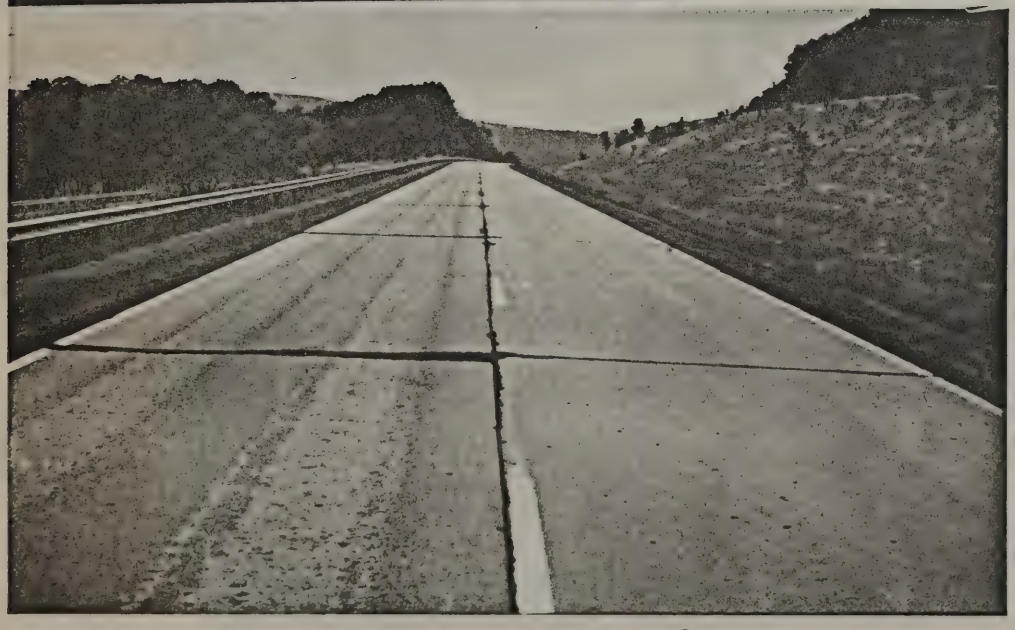


PHOTO 8

View toward oncoming traffic.
Wheel track Ruts in the Driving Lane.
Note, the Transverse Joint Faulting
that has occurred in this lane also.

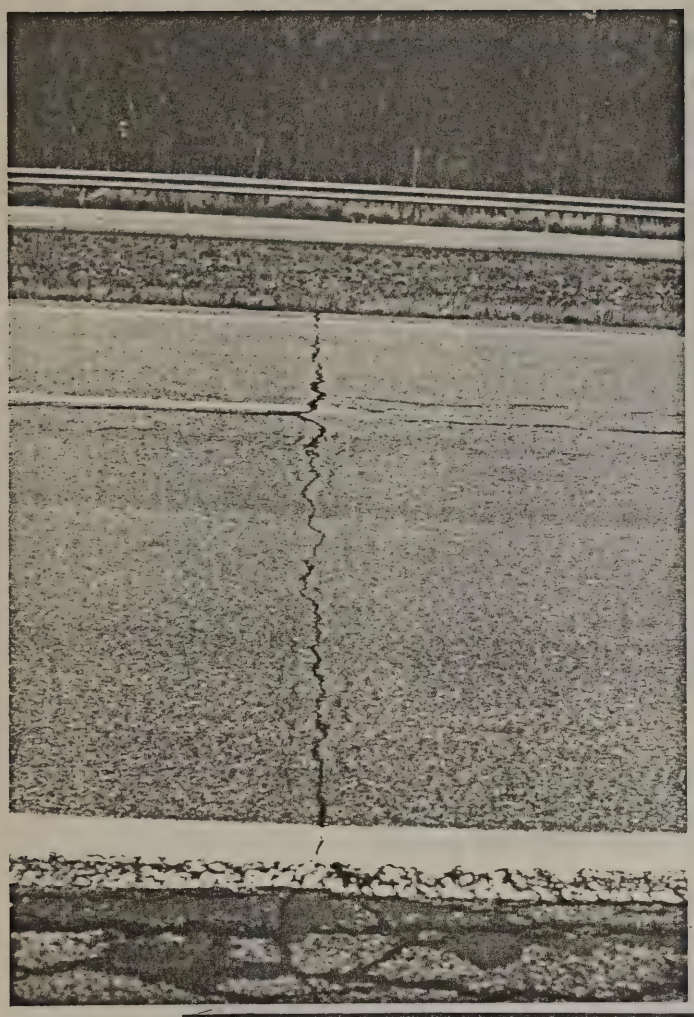


PHOTO 9

Transverse Reflective Cracking in an Asphalt Overlay

PHOTO 10

Longitudinal Reflective Cracking in an Asphalt Overlay, Patched By Maintenance Forces.

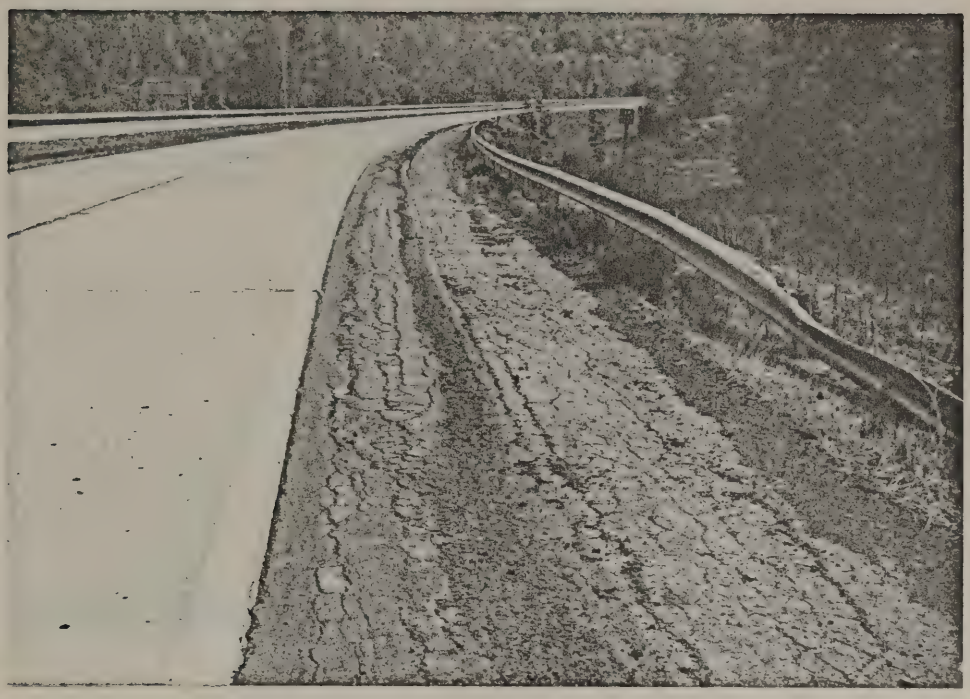
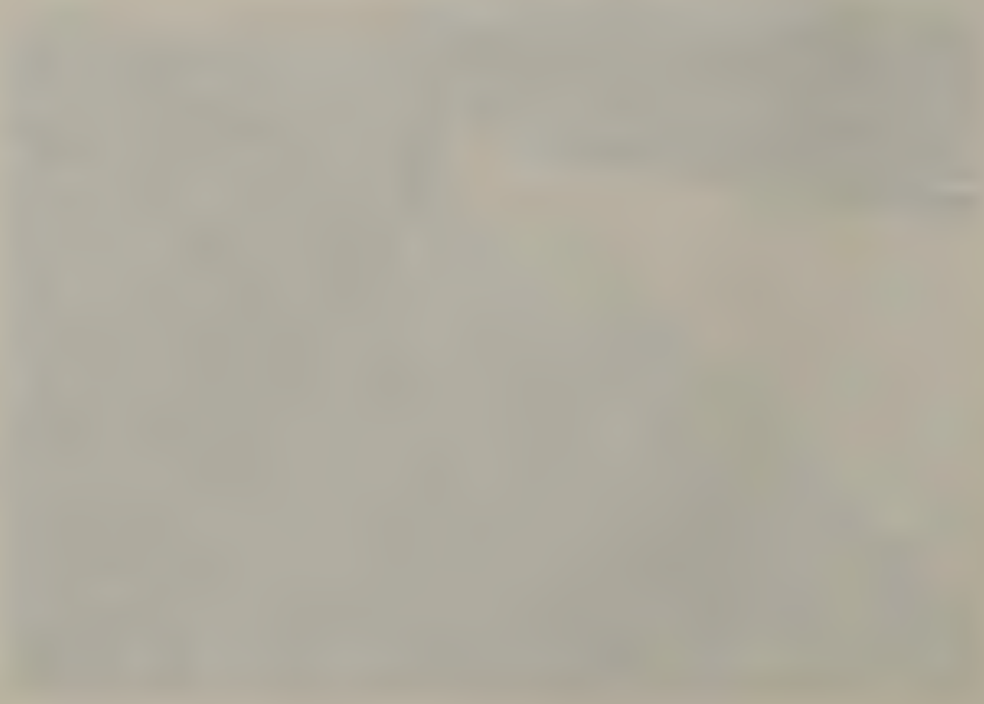


PHOTO 11
Alligator cracking and sand accumulation
along outside edge of shoulder.

PHOTO 12
Alligator Cracking



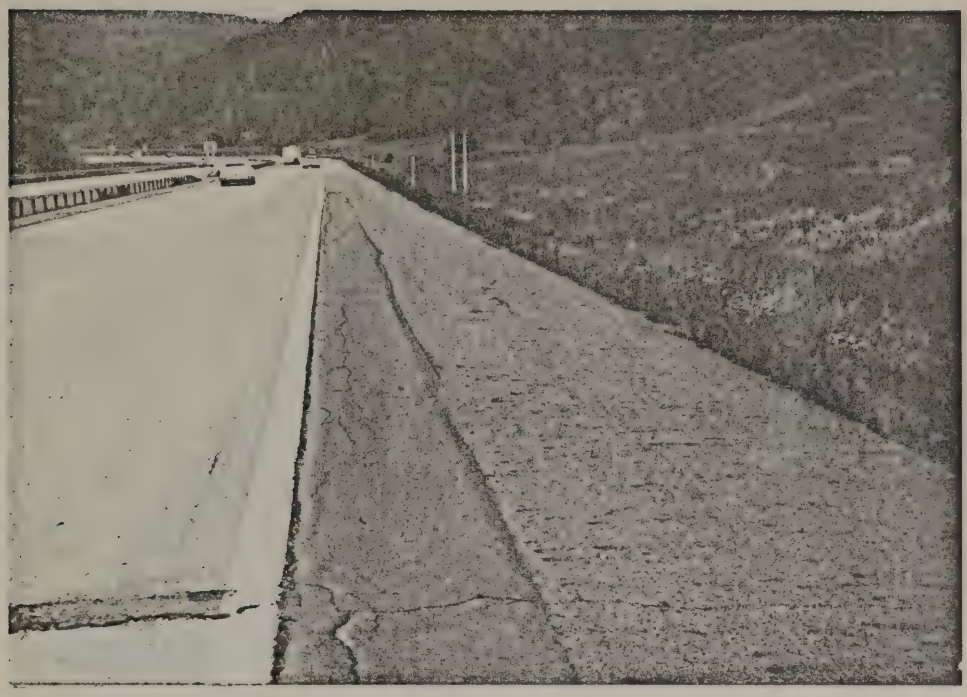


PHOTO 13
Two to three foot wide shim course
at the pavement shoulder interface.

PHOTO 14
Attempt at sealing cracks along
the pavement shoulder interface.

PHOTO 15
Completely disintegrated shoulder with
drofoff at pavement shoulder interface.

Typical cracking one to two feet
in from the pavement shoulder interface.

PHOTO 16

APPENDIX B

Geology Report

The following listing covers all of Route 17 in Delaware County. Recommendations given are preliminary and additional study will be necessary at all locations where work is planned. In the event that any of these rock slopes are recut, it is recommended that the toe of slope be moved back not less than five feet to insure adequate burden for effective presplitting. Cross sections will be required for all rock slopes to be recut and it is requested that they be made available to this office prior to final slope design.

In general, ditches should be kept clear of fallen rock accumulations as these tend to act as "launching pads" which may allow additional falling rock to bounce toward the pavement.

Slope stabilization recommendations are ranked by priority as follows:

A. - first consideration

B. - second consideration

C. - minimal slope work which should be done in conjunction with slope work in other areas

ROCK SLOPES, RC 61-168; RM 17 100.0 TO RM 17 103.0

RM 17	EB or WB	Approx. Height	Existing Setback (edge of pavement to toe of slope)	Rock Type	Preliminary Recommendations	Remarks
100.9±	WB	70 ft.	37 ft. at RM 100.9	Sandstone, siltstone & shale	Benches should be cleaned - Areas of loose rock along edge of lower bench should be scaled. (C)	Two narrow benches in slope - Small amount of rock debris in ditch.
101.3±	WB	60 ft.	33 ft. at RM 101.3	Sandstone, siltstone & shale	Overhangs and loose pieces along the edge of the lower slope should be scaled. (C)	Stepped slope - small amount of rock debris in ditch.

ROCK SLOPES, FARC 52-39; RM 17 103.0 TO RM 17 110.3

109.0±	WB	30 ft.	8 ft. at RM 108.9	Sandstone	Rock slope should be treated with a combination of measures - which would include scaling, buttresses, concrete walls and possible recutting of the rock slope in certain areas. (A)	Area is posted as a fallen rock zone, it appears that fallen rock reaches pavement.

ROCK SLOPES, RARC 64-112; RM 17 110.3 TO RM 17 116.4

RM 17	EB or WB	Approx. Height	Existing Setback (edge of pavement to toe of slope)	Rock Type	Preliminary Recommendations	Remarks
110.8±	WB	20 ft.	29± ft.	Sandstone & shale	Slope should be scaled. (B)	Some fallen rock in ditch, fallen rock may reach pavement.
112.0±	WB	50 ft.	27± ft.	Sandstone & shale	Loose rock and overhangs should be scaled. (B)	Some fallen rock in ditch.
112.0±	EB	8 ft.	37± ft.	Shale & Sandstone	Slope treatment not recommended.	--
115.3±	EB	10 ft.	45± ft.	Sandstone	Slope treatment not recommended.	Small amount of rock debris in ditch - The high flat slope above the 10± feet. Sandstone slope is possibly rock as well.

ROCK SLOPES, RARC 64-112; RM 17 110.3 TO RM 17 116.4

115.3±	WB	50 ft.	30 ft. at RM 115.3	Sandstone	Loose rock should be scaled - Ditch should be cleaned and lined with small stone- If possible chain link fencing should be attached to rear of existing guide rail. (B)	Some fallen rock present in ditch and some may reach the shoulder. A roadway and high rock cut are located above the 50 ft. sandstone slope. - A previously gunited chimney area is failing and should be retreated.

ROCK SLOPES, RC 60-187; RM 17 116.4 TO RM 123.8

RM 17	EB or WB	Approx. Height	Existing Setback (edge of pavement to toe of slope)	Rock Type	Preliminary Recommendations	Remarks
122.8±	WB	20 ft.	varies from 20 to 25 ft.	Sandstone	Slope treatment not recommended - If recut - design slope 3 vertical on 1 horizontal.	--

ROCK SLOPES, RC 60-187; RM 17 116.4 TO RM 123.8

123.2±	WB	50 ft.	20± ft.	Sandstone	Slope treatment not recommended - If recut - design slope 3 vertical on 1 horizontal in sandstone, 1 vertical on 1 horizontal in shale	Stepped slope

ROCK SLOPES, RC 65-151; RM 17 129.6 TO RM 17 135.4

133.2±	EB	100 ft.	45 ft. at RM 133.2	Sandstone with some shale	Slope treatment not recommended	Bench in slope approximately 50 ft. above grade - a minor amount of rock debris in ditch.

ROCK SLOPES, RC 65-161; RM 17 129.6 TO RM 17 135.4 (continued)

RM 17	EB or WB	Approx. Height	Existing Setback (edge of pavement) to toe of slope)	Rock Type	Preliminary Recommendations	Delaware Remarks
133.2±	WB	100 ft.	45 ft. at RM 133.2	Sandstone with some shale.	A minor amount of scaling should be done at east end of slope. (C)	Bench in slope approximately 50 ft. above grade - A minor amount of rock debris present in ditch.

ROCK SLOPES, RC 65-151; RM 17 129.6 TO RM 17 135.4

135.2±	EB	50 ft.	46 ft. at RM 135.3	Sandstone	Clean ditch - Overhangs and columns should be removed or in some cases bolted or buttressed. (B)	Some large pieces of fallen rock present in ditch.
135.3±	WB	20 ft.	20± ft.	Sandstone	Several overhangs should be removed or buttressed. (C)	Minor amount of rock debris present in ditch.

APPENDIX C

Shoulder Core Descriptions

RC 61-168
Hales Eddy - Deposit

1. EB MM 9308-1013

   A seal coat over five (5) inches of stabilized gravel over gravel.

2. EB MM 9308-1014

   A seal coat over two and one half (2½) inches of stabilized gravel over gravel.

3. WB MM 9308-1024

   Miscellaneous pieces of seal coat mixed with dirty gravel.

FARC 52-39
Hales Eddy - Hancock

4. A seal coat over three (3) inches stabilized gravel over gravel.

5. EB MM 9308-1052

   A seal coat over two (2) inches of No. 1A stone over gravel.

6. EB MM 9308-1057

   A half (½) to two (2) inches of seal coat over gravel.

7. WB MM 9308-1084

   One and one-half (1½) inches of blacktop over three-quarters (3/4) of an inch of No. 1A stone over gravel.

FARC 64-112
Hancock - East Branch

8. EB MM 9308-1131

   Three and three-quarter (3 3/4) inches of blacktop over gravel.

9. WB MM 9308-1159

   Three and one-half (3½) inches of blacktop over gravel.

RC 60-187
East Branch - Sullivan County Line Pt. 1
Hancock-East Branch Pt. 1 & 2

10. EB MM 9308-1221

    One (1) inch of blacktop over two and one-half (2½) inches of stabilized gravel over gravel.

11. EB MM 9308-1221

    One (1) inch of blacktop over one (1) inch of stabilized gravel over gravel.

RC 65-171
East Branch - Sullivan County Line Pt. 1

12. EB MM 9308-1243

    A seal coat over three (3) inches of stabilized gravel over gravel.

13. EB MM 9308-1255

    A seal coat over six (6) inches of stabilized gravel over gravel.

RC 65-171
East Branch - Sullivan
County Line Pt. 1

14. WB MM 9308-1268

One (1) inch of seal and chipping over five (5) inches of stabilized gravel over gravel.

RC 65-151
East Branch - Sullivan
County Line Pt. 2

15. EB MM 9308-1307

Three and one-half (3½) inches of blacktop over gravel.

16. WB MM 9308-1342

Four and three-quarter (4 3/4) inches of blacktop over gravel.

01036
LRI